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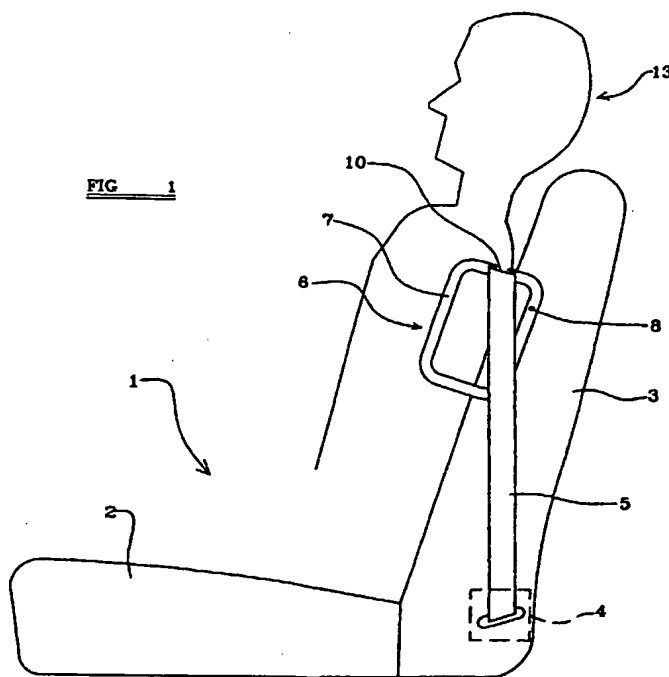
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(56) Documents Cited  
**GB 2296655 A** **GB 2144323 A**  
**US 6234525 B1** **US 5286091 A**

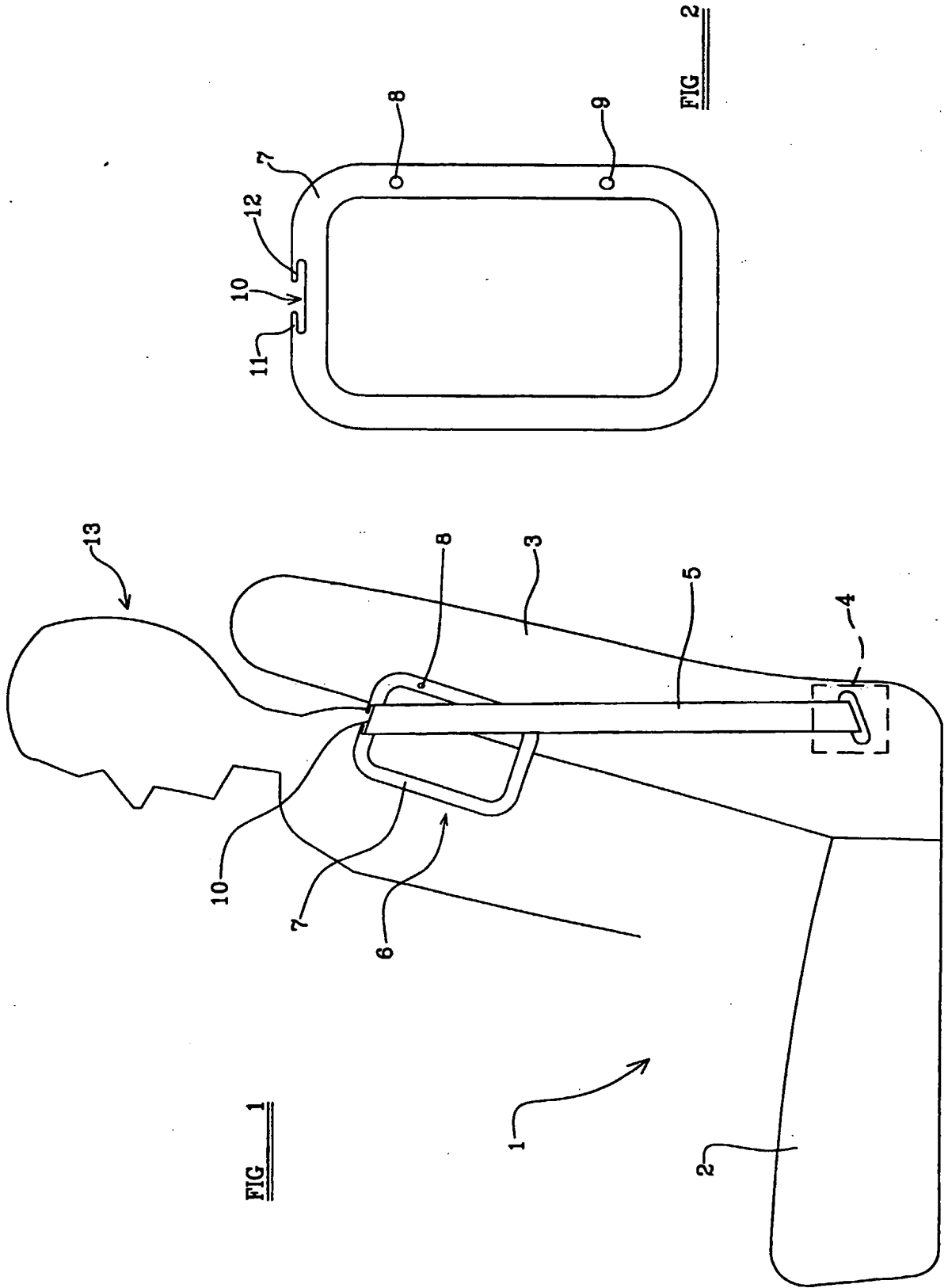
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(54) Abstract Title  
**Impact restraint element for vehicle seat**

(57) A safety device for a vehicle comprises a restraint element 6 mounted on the back-rest 3 of a vehicle seat 1. The element extends forwardly from the side of the back-rest and is provided with a guide 10 to guide a safety belt 5. The guide is located forwardly of the middle part of the front face of the back-rest adjacent the side of the seat. The guide may serve to guide an auxiliary safety belt (figure 3), for use in addition to the conventional three-point belt, to assist in retaining the occupant within the seat. The belt guide may include part of a retractor mechanism or buckle and tongue combination, and the frame 7 of the restraint element may be formed of a yieldable material so as to absorb impact energy in the event of the occupant moving sideways in a collision. The restraint element may also be mounted by means of a resilient plate (figure 6), and it may be provided with actuation means (figure 7) which also inflate an air bag provided on the frame (figure 8).



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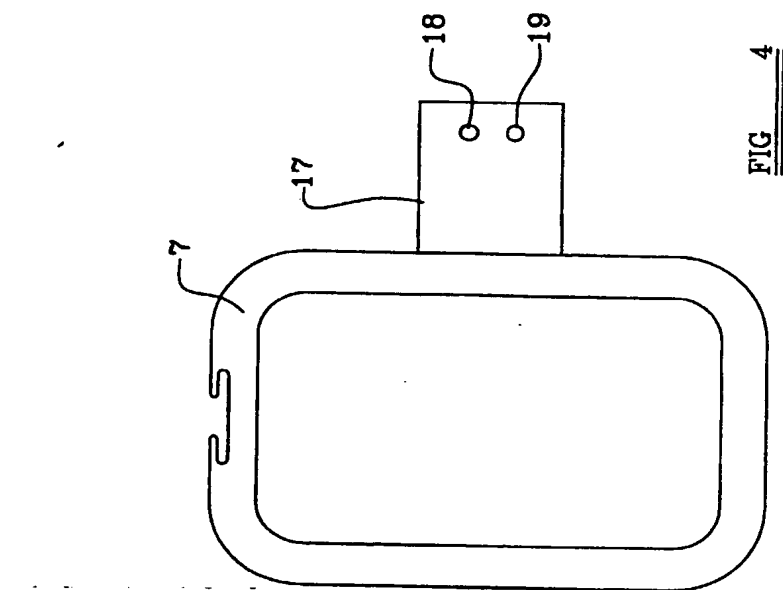


FIG 4

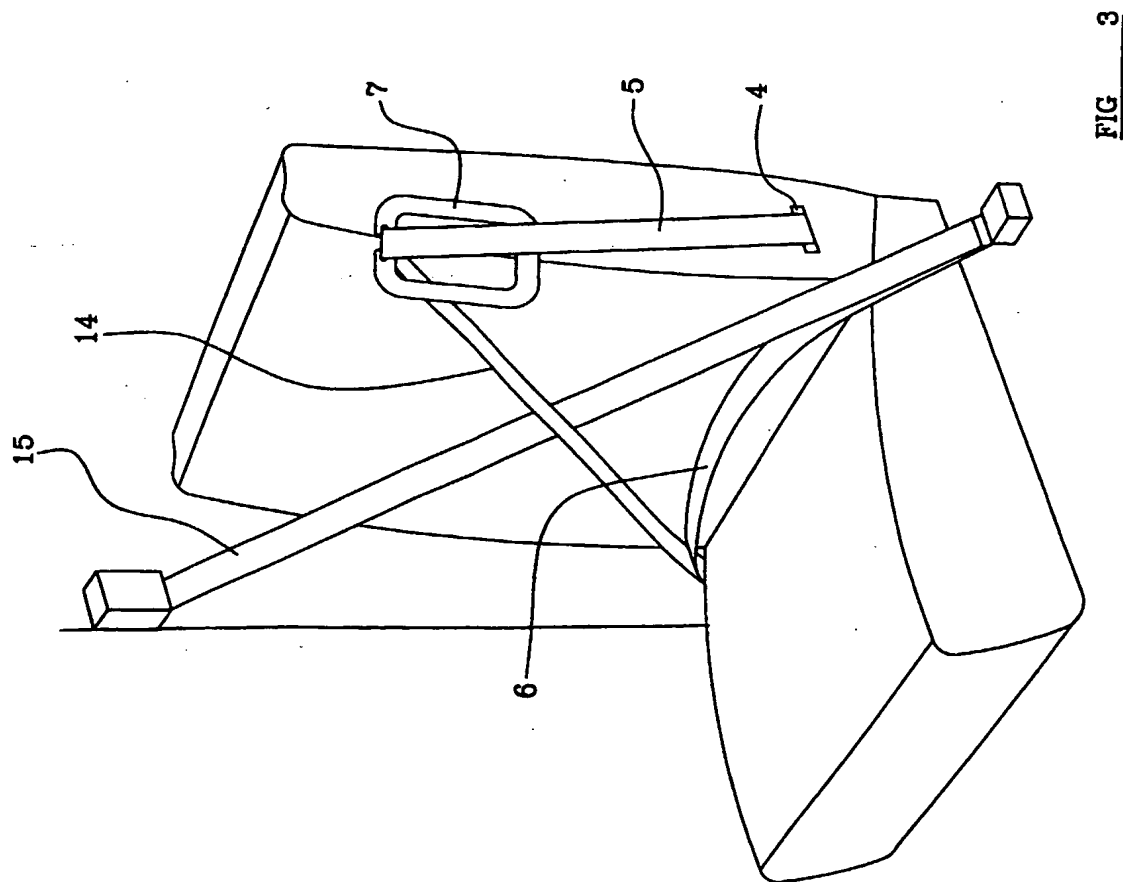


FIG 3

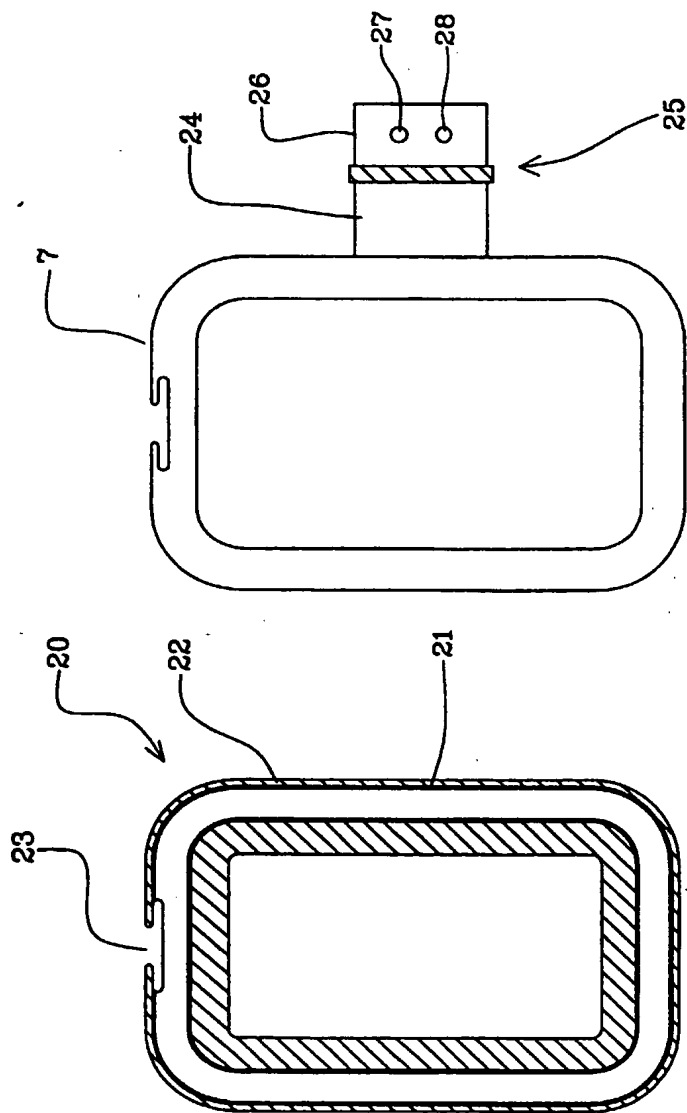
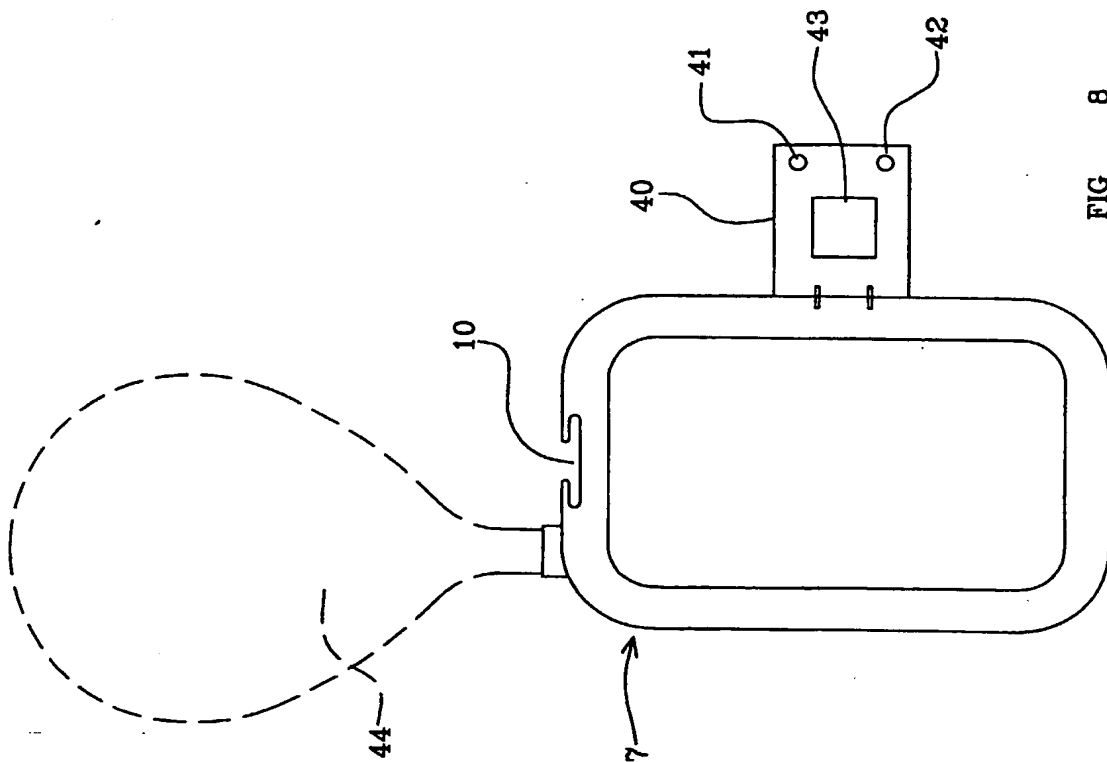
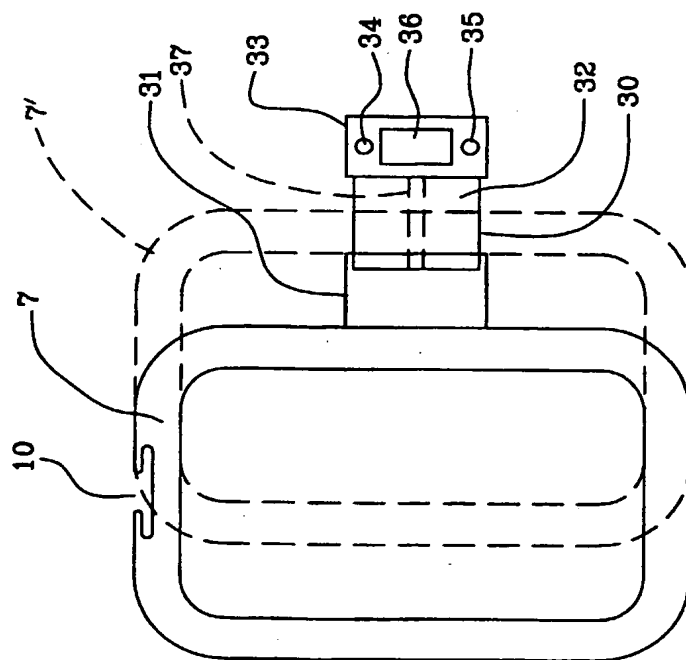


FIG 6

FIG 5



**FIG 8**



**FIG 7**

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**DESCRIPTION OF INVENTION**

**“IMPROVEMENTS IN OR RELATING TO A SAFETY DEVICE”**

**THE PRESENT INVENTION** relates to a safety device, and more particularly relates to a safety device for use in a motor vehicle.

It has been proposed to provide a safety-belt to restrain the occupant of a seat in a motor vehicle. In some instances the safety-belt is entirely integrated into the seat.

A typical safety-belt includes a lap portion which passes across the lap of the occupant of the seat and a diagonal portion, which extends generally from one hip of the occupant and across the opposite shoulder. In certain impact situations, in particular a side impact situation, the belt passing over the shoulder may press upon the neck of the occupant, causing injuries to the occupant. In embodiments where the belt passes through an anchoring point mounted on the seat, high torsion forces may be applied to the anchoring point, causing the seat back to deform in an undesirable manner.

The present invention seeks to provide an improved safety device.

According to this invention there is provided a safety device, the safety device comprising an impact restraint element adapted to be mounted on the back-rest of a vehicle seat to extend forwardly from the side of the back-rest, the impact restraint element being provided with a guide means to guide a safety-belt, the guide being located to be positioned forwardly of the middle part of the front face to the back-rest of the seat at a position adjacent the side of the seat.

Preferably the restraint element is in the form of a frame provided with said guide at the upper part of the frame.

Conveniently the safety-belt-guide comprises a channel formed in the frame, the channel having two opposed inwardly directed lips.

Alternatively the safety-belt-guide is constituted by part of a retractor mechanism provided on the restrain element.

In a further alternative embodiment the safety-belt-guide is constituted by a buckle and tongue combination.

Conveniently the frame is formed of a metal or plastics material tube.

Preferably the frame is formed of a yieldable material adapted to yield with the absorption of energy when subjected to a force in excess of a predetermined force.

Preferably the yieldable material is an expanded foam material.

In one embodiment wherein the restraint element is adapted to be mounted directly to the back-rest of a vehicle seat.

Alternatively the restraint element is provided with a mounting plate by means of which the restraint element may be mounted to the vehicle seat, the mounting plate being yieldable.

Preferably the mounting plate is plastically deformable.

Alternatively the mounting plate is resilient.

In one embodiment the mounting plate is connected to a connection plate by means of a hinge.

Preferably the hinge is provided with a catch to retain the restraint element in a predetermined position.

In a preferred embodiment a mechanism is provided to move the restraint element forwardly in response to an accident situation.

Conveniently the mechanism comprises a piston and cylinder mechanism, there being a gas generator adapted to be actuated in response to an accident to inject gas into the cylinder to move the restraint element forwardly.

Preferably the restraint element carries an air-bag, a gas generator being provided to inflate the air-bag in response to the sensing of an accident.

The invention also relate to the safety device as described above when mounted on or integrated with a vehicle seat.



Preferably the restraint element is on the inboard side of the seat.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a side view of a vehicle seat provided with a safety device in accordance with the invention,

FIGURE 2 is an enlarged view of the safety device shown on the seat of Figure 1,

FIGURE 3 is a perspective view of the seat of Figure 1 illustrating a complementary safety-belt,

FIGURE 4 is a view corresponding to Figure 2 illustrating a modified embodiment of the invention,

FIGURE 5 is a cross-sectional view of part of one embodiment of the invention,

FIGURE 6 is a view corresponding to Figure 4 illustrating a further modified embodiment of the invention,

FIGURE 7 is a view corresponding to Figure 4 illustrating yet another modified embodiment of the invention, and

FIGURE 8 is a view corresponding to Figure 4 illustrating yet a further modified embodiment of the invention.

A safety device in accordance with the present invention is intended to be mounted on a vehicle seat so as to extend forwardly from a side part of the seat back. The safety device is intended to act as a restraint element, to restrain the upper torso of a seat occupant minimising the risk of the occupant of the seat moving sideways relative to the seat, especially in a so-called side impact situation. The safety device also provides a guide for a safety-belt. The guide for the safety-belt is located forwardly of the middle part of the front face of the back-rest of the seat at a position off-set to the inboard side of the seat, as the safety-device is mounted on this side of the seat. The inboard side of the seat is the side furthest from the adjacent door. The guide guides that part of the safety-belt that forms the upper part of the diagonal of the safety-belt, and thus the safety-belt is positioned in such a way that the risk of the safety-belt acting directly on the neck of the seat occupant is minimised. Indeed, in a preferred embodiment the safety-belt passing through the guide of the safety device of the present invention extends downwardly from the guide to a retractor mounted at a level lower than the guide, and thus the highest part of the safety-belt is that part within the guide which is located substantially level with the shoulder of the seat occupant.

Referring now to the accompanying drawings, Figure 1 illustrates, as in a side view, a vehicle seat 1 provided with a squab 2 and a back-rest 3. The seat is provided with an integral safety-belt and thus a retractor mechanism 4 is provided which is mounted within the lower part of the back-rest 3 of the seat. A safety-belt 5 has one end thereof secured to the retractor 4, the safety-belt 5

emerging from the lower part of the back-rest 3 of the seat and extending generally upwardly towards the top of the back-rest.

Provided at the upper part of the back-rest 3 of the seat is a safety device 6. The safety device 6 comprises an open rectangular frame 7 which is preferably formed from a metal or plastics material tube. As the frame is an open frame it does not restrict the vision of the seat occupant. The frame has rounded corners. The frame maybe planar, or the upper and lower parts of the frame may be curved so that the frame presents a curved appearance. The frame may be provided with an outer protective sleeve of textile, rubber or plastics material. The frame may, in some embodiments, be formed integrally with the framework of the back 3 of the seat, but in the presently described embodiment the frame 7 is provided with two fixing apertures 8, 9 formed in one side thereof, adapted to receive screws, bolts or other fastening elements so that the frame 7 may be secured to the inner framework (not shown) present within the back-rest 3 of the seat. The upper-most part of the frame 7 defines a belt-guide for guiding the seat-belt 5, the belt-guide comprising a slot 10 formed in the upper part of the frame constituting a channel having a relatively wide base and two inwardly directed lips 11, 12.

Whilst one type of particular belt-guide has been described, it is to be understood that many alternate types of belt-guide may be provided, including belt-guides which are fitted to the frame rather than being formed integrally with the frame. Also it is to be appreciated that in a further embodiment of the invention the retractor may be mounted on the frame, part of the retractor itself then constituting the guide.

Whilst Figure 1 shows the position of the seat-belt 5 when the seat is not occupied, a seat occupant 13 is shown in phantom, and it can be seen that the

frame 7 of the safety device 6, when mounted to the back-rest of the seat, extends forwardly of the front surface of the back-rest of the seat at a position at the side of the seat so that the frame 7 is located to the side of the occupant in the region of the upper arm and shoulder. Therefore, should the occupant of the seat tend to move sideways with the seat during an impact situation, that sideways movement will be resisted by the frame 7. The frame 7 may be made to be yieldable, with energy-absorption, when submitted to a predetermined load. The risk of the frame 7 itself injuring the seat occupant will thereby be reduced.

The belt-guide 10 carried by the frame is located substantially at the level of the shoulder of the seat occupant, and, when the safety-belt 5 is in use, the belt will pass upwards from the retractor 4 through the guide 10 provided in the frame 7, immediately across the shoulder of the seat occupant and then diagonally downwardly 14 (see Figure 3) towards the opposite hip of the seat occupant. Thus, no part of the safety-belt is aligned with the neck of the seat occupant, and thus the risk of the seat-belt directly injuring the neck of the occupant is substantially reduced.

Figure 3 shows that the safety-belt 5 may be used in conjunction with a conventional "3-point" belt which has a diagonal portion 15 and a lap portion 16.

Whilst the retractor 4 of the safety-belt 5 has been shown to be in the lower part of the back rest 3, the retractor 4 could be at a higher position in the back rest 3, or in the squab 2, or could be floor mounted adjacent the seat. Alternatively the retractor could be on the other side of the seat, and a buckle can be provided at the inboard side of the seat to receive an appropriate tongue

on the end of the safety-belt. 5. The buckle may be provided on the frame so that the buckle and tongue combination constitute the guide.

Figure 4 illustrates a modified embodiment of the invention in which the frame 7 is not directly mounted to the seat, but instead is mounted to the seat by means of an extending mounting plate 17 which extends from one side of the frame. The mounting plate 17 is provided with fixing apertures 18, 19 to receive bolts, screws or other fastening elements to secure the frame 7 to the framework provided within the interior of the back rest 3. The mounting plate 17 enables the frame 7 to be mounted at a slightly more forward position than that shown in Figure 1, which may enhance the functioning of the frame 7. Also the plate 17 may be formed from a plastically deformable material or from a very strong spring. In either event, if the sideways force applied to the frame 7 by an occupant of the seat exceeds a predetermined threshold, the frame 7 will move yieldingly, whilst absorbing energy.

Figure 5 illustrates a modified frame 20. The modified frame includes an inner tubular frame 21, comprising a tube of metal or a tube of appropriate plastics material. The entire frame is surrounded by a soft yieldable material, such as foam padding 22, which can compress, with the absorption of energy. The padding 22 may be contained within an outer sleeve of fabric, rubber or plastics material. The upper part of the frame is provided with a belt-guide 23. A frame of this type may be used in any embodiment of the invention, and the exterior padding 22 will help absorb energy as an occupant of the seat moves laterally towards the frame and is restrained by the frame.

Figure 6 illustrates a further modified embodiment of the invention. In this embodiment a frame 7 of the type described above is provided with a mounting plate 24 which is connected, by means of a hinge 25, to a support

plate 26 which has apertures 27, 28 to receive bolts, screws or other fastening elements to secure the plate 26 to the framework provided within the back-rest of a seat. The hinge 25 is provided with an integral catch mechanism so that the frame 7 may be locked in selected hinged positions.

It is to be appreciated that with the safety device illustrated in Figure 5 in the condition illustrated, the frame 7 would be located adjacent the side of the seat, and the frame would be operative. The catch mechanism will lock the hinge so that the frame cannot move freely from the operative position. However, it is envisaged that, if desired, the catch provided on the hinge 25 may be released and the frame may then be moved freely pivotally about the axis of the hinge to extend not towards the front of the seat, but to extend towards the rear of the seat. With the frame in this position, access to the adjacent seat may be facilitated.

It is to be appreciated that the mounting plate 24 may be made of a yieldable material, such as a plastically deformable material or a strong spring material, so that when the frame is in the operative position and the hinge is located by the catch, should a seat occupant impinge with the frame 7, the mounting plate 24 may yield, absorbing energy.

Figure 7 illustrates another embodiment of the invention incorporating a frame 7 of the type described above. However, in this embodiment of the invention, the frame 7 is adapted to be mounted to the framework present within the back-rest 3 of the seat by means of a piston and cylinder unit 30. A cylinder 31 of the piston and cylinder unit is mounted to one arm of the frame, and a piston 32, which is received within the cylinder 31, has one end thereof connected, by a connecting plate 33 which presents apertures 34 and 35 to receive screws, bolts or other fastening means, to the framework provided

within the back-rest 3 of the seat. A gas generator or inflator 36 is provided which is formed integrally with the base of the piston and which communicates with the interior of the cylinder 31 by means of a gas flow conduit 37 formed within the piston. The gas generator or inflator may be of the cold gas type, the pyrotechnic type or the hybrid type.

The frame 7 occupies an initial position 7' shown in phantom. On actuation of the gas generator, however, gas is supplied to the space within the cylinder 31 and the framework 7 moves to the position shown in solid line in Figure 7. Thus the framework 7 moves forwardly to an operative position. It is envisaged that the gas generator 36 will be actuated in response to a signal from an appropriate accident sensor so that the framework 7 is moved from an initial relatively unobtrusive position 7' to an ideal operating position, in which it may restrain a seat occupant, in the event that an accident should arise. Of course, the connection plate 33 may be connected to the framework by means of a yieldable energy-absorbing connection.

Figure 8 illustrates another embodiment of the invention in which the framework 7 is adapted to be mounted to the framework present within the back-rest 3 of the seat by means of a mounting unit 40, the mounting unit 40 presenting apertures 41, 42 to receive screws, bolts or other fastening elements. The mounting unit 40 incorporates a gas generator or inflator 43. The gas generator 43 is connected to an air-bag 44 (shown inflated in phantom) which is initially mounted on the top part of the frame adjacent the seat-belt-guide 10. The gas generator or inflator may be of the cold gas type, the pyrotechnic type or the hybrid type.

It is to be appreciated that, in this embodiment, when an accident is sensed by a sensor and the gas generator is actuated, the air-bag is inflated and

is located immediately adjacent the head of the seat occupant, thus restraining the head of the occupant. The embodiments of Figures 7 and 8 may be combined so that an air-bag is present on the frame 7 that is adapted to move forwardly, and a single gas generator or inflator may move the frame forwardly with the described piston and cylinder arrangement, and also inflate the air-bag 44.

In the present Specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.



## CLAIMS:

1. A safety device, the safety device comprising an impact restraint element adapted to be mounted on the back-rest of a vehicle seat to extend forwardly from the side of the back-rest, the impact restraint element being provided with a guide means to guide a safety-belt, the guide being located to be positioned forwardly of the middle part of the front face to the back-rest of the seat at a position adjacent the side of the seat.
2. A safety device according to Claim 1 wherein the restraint element is in the form of a frame provided with said guide at the upper part of the frame.
3. A safety device according to Claim 2 wherein the safety-belt-guide comprises a channel formed in the frame, the channel having two opposed inwardly directed lips.
4. A safety device according to Claim 2 wherein the safety-belt-guide is constituted by part of a retractor mechanism provided on the restraint element.
5. A safety device according to claim 2 wherein the safety-belt-guide is constituted by a buckle and tongue combination.
6. A safety device according to any one of Claims 2 to 3 wherein the frame is formed of a metal or plastics material tube.

7. A safety device according to any one of Claims 2 to 6 wherein the frame is formed of a yieldable material adapted to yield with the absorption of energy when subjected to a force in excess of a predetermined force.
8. A safety device according to any one of Claims 2 to 7 wherein the frame is provided with an outer covering of a yieldable material.
9. A safety device according to Claim 8 wherein the yieldable material is an expanded foam material.
10. A safety device according to any one of the preceding Claims wherein the restraint element is adapted to be mounted directly to the back-rest of a vehicle seat.
11. A safety device according to any one of Claims 1 to 9 wherein the restraint element is provided with a mounting plate by means of which the restraint element may be mounted to the vehicle seat, the mounting plate being yieldable.
12. A safety device according to Claim 11 wherein the mounting plate is plastically deformable.
13. A safety device according to Claim 11 wherein the mounting plate is resilient.
14. A safety device according to any one of Claims 11 to 13 wherein the mounting plate is connected to a connection plate by means of a hinge.

15. A safety device according to Claim 14 wherein the hinge is provided with a catch to retain the restraint element in a predetermined position.
16. A safety device according to any one of the preceding Claims wherein a mechanism is provided to move the restraint element forwardly in response to an accident situation.
17. A safety device according to Claim 16 wherein the mechanism comprises a piston and cylinder mechanism, there being a gas generator adapted to be actuated in response to an accident to inject gas into the cylinder to move the restraint element forwardly.
18. A safety device according to any one of the preceding Claims wherein the restraint element carries an air-bag, a gas generator being provided to inflate the air-bag in response to the sensing of an accident.
19. A safety device according to any one of the preceding Claims when mounted on or integrated with a vehicle seat.
20. A safety device according to Claim 19 wherein the restraint element is on the inboard side of the seat.
21. A safety device substantially as herein described with reference to and as shown in Figures 1 to 3 of the accompanying drawings.
22. A safety device substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings as modified by Figure 4.

23. A safety device substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings as modified by Figure 5.

24. A safety device substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings as modified by Figure 6.

25. A safety device substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings as modified by Figure 7.

26. A safety device substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings as modified by Figure 8.

27. Any novel feature or combination of features disclosed herein.



INVESTOR IN PEOPLE

Application No: GB 0207473.0  
Claims searched: 1 to 20

Examiner: Peter Gardiner  
Date of search: 17 July 2002

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): A4L: LBEJ, LBEQ  
B7B: BSBCR, BSBCX, BSDB, BVRB, BVRC, BVRJ

Int Cl (Ed.7): B60N: 2/42, 2/46  
B60R: 21/02, 21/055, 21/18, 21/20, 22/18, 22/26

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2296655 A	DARTREY (see belt latch 12 provided on impact wing of seat)	1,10,19,20
X	GB 2144323 A	CLARK EQUIPMENT (see restraint arms 60, 62 and belt 64)	1,10,19,20
X	US 6234525 B1	STILL GMBH (see restraint bar 2 and belt 7 in figure 1)	1,10,19,20
X	US 5286091	TRW (see restraint bar 18 and belt in figures 1 and 2)	1,10,19,20

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.